Helical Beam Data Transmission Method Impervious to Surveillance by Gravitational Observatory

4 July 2024
Simon Edwards
Research Acceleration Initiative

Introduction

Helical beam data transmission promises to enable more secure, higher-bandwidth communication between satellites and ground stations as helical EM can resist scattering to an extent exceeding that of all other forms of structured EM.

While interception of the signals associated with such beams would be highly difficult using conventional methods, highly sophisticated ELINT methods such as the detection of gravity waves associated with electromagnetic emissions could conceivably be used to intercept transmitted information. Thus, a slight alteration to the methodology of transmission of information through helical EM is called for in order to protect against intercept by gravitational observatory.

Abstract

In order to achieve this end, rather than pulsing a helical beam 'on' and 'off,' information would be encoded by alternating between the emission of light from one of two apertures each of which project a beam which share a point of convergence at the satellite. Electronic switching would be used in order to emit light from one of two pump diodes and which has been used by the ground station would be determined by the receiving satellites through the analysis of the helicity of the received beam. As only one beam or the other would be enabled at a time and as both beams would transmit at precisely the same level of power, the operator of a gravitational observatory would not be able to garner any useful information concerning patterns of transmission through this method.

Measuring Helicity Through Depth Penetration/Timing Analysis without Need for Precise Positional Assessment

Extant systems which are designed to mitigate jamming effects by logical filtering of EM featuring angular momentum and/or helicity which does not comport with expected values rely upon determining the position of strike of energy striking a series of gold plates buffered by beryllium and measuring the time of arrival as well as position of strike in order to make the necessary inferences. For microwave-band EM, this method is well and good, but in the visible spectrum, light tends to be entirely absorbed by the first layer of metal encountered. Helical light in the visible spectrum, however, has greater penetrative capacity than ordinary light and can therefore reach a certain depth and retain sufficient energy to be detected.

Taking this into consideration, it should be possible to improve the bandwidth of this type of helicity detection mechanism by inferentially determining whether one of two possible pre-set values for helicity were being employed using a simple two-layer system rather than a system requiring three or more layers. Slightly helicized light with a degree of helicization barely sufficient to defeat atmospheric scattering would be incapable of penetrating the beryllium and being detected by the second layer. More intensely helicized light, even at the same transmitting power, would be able to penetrate this buffer layer and could be detected by a second layer. Thus, in only two layers, the pertinent information could be recovered by a receiver concerning the binary '0' or '1' state without leaking useful gravitational information to an observer. This should enhance the effective bandwidth of such a system relative to one which performs a more complex analysis of helicity and angular momentum with respect to time. This system could be made to function on as simple a mode of operation as "if layer one detects energy, then '0', if layer two also detects energy in an expected window of time and at the expected energy level, then '1.'"

Conclusion

As traditional intercept methods would be stymied by the collimation of these beams and as unconventional intercept methods i.e. negative discrepancy gravitational detection would also be stymied by this approach, it would make sense to take into account the possibility of competing gravitational wave observatories employed by adversaries when designing next-generation LASER-based SATCOM mechanisms. The aforementioned approach would constitute a high-bandwidth communication mechanism which is essentially impervious to intercept, even by experimental methods, excluding the RPM-E method delineated by this author in 19 April 2023. RPM-E, although potentially effective for eavesdropping upon this type of data link, would require the cohesive entanglement of large numbers of photons which would also need to undergo similar helicization in order to successfully bisect the beams. In the final analysis, it is highly unlikely that an adversary would be able to intercept signals if we were to utilized the aforementioned approach.